

two layers, the external of which has pores, which are larger and less numerous than those of the inner layer. The egg adheres by the surface of the external layer, but no separation of the two layers takes place. In *Osmerus eperlanus* the same differentiation occurs, and the external layer, after becoming attached by one point or other, detaches itself from the inner layer except at one circular area, thus forming a membrane by which the ovum is suspended from its attachment.

It remains to be mentioned that in the unripe ova, which are forcibly expressed from the parent, there is a delicate structureless membrane external to the zona radiata. This is doubtless derived from the ovary; it is perhaps the connective-tissue layer of the follicle, which becomes reduced in thickness as the egg attains its mature size; it is certain that the perfectly ripe ovum is enveloped only in its double zona radiata.

#### EXPLANATION OF PLATE XXX.

- Fig. 1. Nearly ripe ovum of *Osmerus eperlanus*, taken from female, and examined in fresh condition. *a.* Thin membrane derived from the ovary, not present in the naturally deposited mature ovum. *z.r.* Zona radiata; its division into two layers is not shown. *g.v.* Germinal vesicle. (Zeiss A, Oc. 2.)
2. Outline of attached ovum of *Osmerus*. *s.m.* The suspensory membrane formed by the zona radiata externa. *z.r.i.* The zona radiata interna. (Zeiss A, Oc. 2.)
3. The membranes of an almost mature ovum of *Osmerus*, as seen in the fresh state after rupture of the zona radiata externa by pressure of the cover-glass. *z.r.i.* Zona radiata interna. *z.r.e.* Zona radiata externa. (Zeiss A, Oc. 2.)
4. The zona radiata of egg of *Osmerus*, as seen in fresh condition in optical section, in process of separation of the two layers. *z.r.e.*, *z.r.i.*, as before. (Zeiss E, Oc. 2.)

May 18, 1886.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

Mr. C. W. Rosset exhibited and made remarks on a series of photographs taken during a recent visit to the Maldive Islands, and gave the following account of his collections in these islands:—

“On my return from an eighteen months’ stay among the Veddas of Ceylon, I undertook a journey to the Maldives, in October 1885, in the course of which I passed seventy-five days on the Málé Atol. The principal object of my journey was to make a complete Ethnographical collection, as also to take a series of photographs of the people, objects and places of interest, and so on, and obtain full particulars about habits and customs, manufactures, trade, &c. I was also able to make a zoological collection.

“I was not able to carry out my original plan, as the Sultan absolutely refused to allow me to quit Málé Atol, so that I was unable to visit the southern islands of the group. It will therefore

be necessary for me to revisit the islands, when I shall commence at the southernmost Atoll, and hope to gradually work my way north. I hope to leave next September on my second journey. The Ethnographical collection which I was able to bring back is now exhibited in the Ceylon Court of the Colonial and Indian Exhibition, and this has taken up so much of my time that I have so far been unable to classify and arrange my zoological specimens. A short paper descriptive of my stay on Málé Atoll will shortly be read before the Royal Geographical Society.

“The zoology of the Maldives is not of importance so far as animals are concerned. Domestic animals have been imported from India; and there are at present bullocks, cows, sheep, and goats on the islands; the first named, however, are few in number, and all belong to the Sultan; but the last are reared by the Maldivians, and there are about five hundred of them on Málé Atoll. There are a few cats, and former writers on the Maldives mention the presence of the Mongoose; but I saw none on Málé Atoll, and all the natives with whom I came in contact told me they had never seen any. Flying-foxes are numerous and very destructive, but their ravages are eclipsed by those of the cocoa-nut rats, who destroy thousands of nuts yearly. I found a kind of musk-rat, with black-and-white fur and a pointed tail, in large numbers.

“I brought with me a large number of lizards, ground-snakes, beetles, butterflies, fish, sea-animals, and corals, of which I am only able to show a small number to-night.

“The fauna of the Maldives, *i. e.* of the Northern Atolls, is very similar to that of India and Ceylon; I have been given to understand, on the other hand, that on the Southern Atolls it resembles that of Mauritius, the Seychelles, and Madagascar. Birds and butterflies are only seen at certain seasons; the north-east monsoon brings these from India and Ceylon, which are then to be found on most islands of the Northern Atolls, whilst during the south-west monsoon species from Mauritius &c. are brought to the Southern Atolls.

“The Maldivian Islands are nearly all of coral-formation. I found several pieces of lava and pumice-stone on the sea-shore; but these evidently came from Java at the time of the great eruption and earthquake there, as the natives assured me they had only been seen for the last two or three years.”

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Mr. Philip Crowley, F.Z.S., exhibited some pupæ of Nocturnal Lepidoptera from Natal, and made the following observations:—

“Some few months since, when Mr. Thomson exhibited some large specimens of Saturniidae hatched in the Gardens from pupæ received from South Africa, I asked if any one present could tell me whether these species were subterranean in their pupa state, and I could get no satisfactory answer; one or two said they believed they spun up in the leaves of the food-plant. My Natal correspondent was therefore asked to send me some cocoons. I received his reply some six weeks since, and a consignment of pupæ on Monday the 18th, some of which I now exhibit. In his letter he says:—‘The larvæ of all our big

Moths burrow into the soil to a depth of 2 or 3 inches, and there they remain, some for six months, some for ten. The way in which I manage is this: first I search in due season for the caterpillars, which having found I remove to bushes and trees as near my residence as possible. I then watch them carefully day by day, until I consider them large enough to remove into my breeding-cages, all of which have at least six inches of good soil at the bottom. When full-fed they burrow, as I have said before, and exactly six weeks after the disappearance of the last one, I dig up all the pupæ and lay them carefully side by side upon moss which is from time to time moistened.

“I may add I received last year pupæ of the following species from this source, all of which hatched out well with the exception of six or eight:—

*Cyanissa maia.*  
*Bunea caffraria.*  
*Antherea tyrreha.*  
 ——— *menippe.*  
 ——— *wahlbergii.*  
*Cirina forda.*

“The pupæ which I now exhibit will, I think, by their general appearance, bear out the statement of my correspondent.”

Mr. Joseph Whitaker, F.Z.S., exhibited a specimen of Wilson's Phalarope, *Steganopus wilsoni* (Sabine), believed to have been shot some years ago at Sutton Ambion, near Market Bosworth in Leicestershire. Mr. Whitaker had found the bird stuffed in a case of local species of birds which had belonged to a Mr. Richard Bradfield, who stated that he shot the specimen in question on a small pond, into which the manure ran from his farm-yard, and the breast of the bird showed a stain which might have been so produced. The owner was quite unaware of the rarity of the species, looking upon it merely as a curiosity; and unless there should have been some accidental exchange at the bird-stuffer's, the evidence as to its genuineness seemed entitled to credence.

The following papers were read:—

1. On a fourth Male Specimen of King William the Third's Paradisc-bird. By A. B. MEYER, M.D., Director Royal Zoological Museum of Dresden, C.M.Z.S., &c.

[Received April 28, 1886.]

In the year 1875 I described and figured (Mitth. Zool. Mus. Dresden, i. p. 3, pl. i.) *Rhipidornis gulielmi-tertii*, after a male and female specimen forwarded to me by my friend the late S. C. S. W. van Musschenbroek from Ternate, and a short time afterwards Gould figured a second male specimen ('Birds of New

Guinea,' pt. ii. pl. 2, 1876), which belonged to the Museum of Warsaw.

Since then only one specimen has been obtained (see Proc. Zool. Soc. 1883, p. 252), which is now in the British Museum, but nothing trustworthy has been made out as to the supposed habitat of the species—Waigiou (*cf.* Salvadori, Orn. Pap. ii. p. 646, 1881).

Quite recently I have procured for the Dresden Museum a male example of this rare species, therefore the fourth, offered by a merchant from Amsterdam together with other Papuan birds. This specimen resembles exactly those figured by Gould and myself, but its origin is quite as obscure as that of the other specimens. The accompanying birds being apparently of species found in New Guinea, and not in Waigiou, perhaps Beccari's supposition (*Ann. Mus. Civ. Gen.* vii. p. 710, 1875), that this Paradise-bird occurs on N.W. New Guinea and Salawati, may be right.

As it is of importance to know where type specimens are preserved, I add the history of those of *Rhipidornis gulielmi-tertii* described by myself. Having kept them in the Dresden Museum since the year 1875, I one day in the year 1877 received a telegram from van Musschenbroek, who had returned home in 1876, telling me that he wished to show the birds to King William III. I sent the specimens to him, and never saw them again. They remained in the hands of the king, and we never succeeded in recovering these types for science, though supported by the late Prof. Schlegel of Leyden; but after van Musschenbroek's death in the year 1883, the King of the Netherlands delivered the specimens to the Museum of the Zoological Society (*Natura artis magistra*) of Amsterdam, where they probably will remain.

2. Descriptions of some new or little-known Earthworms, together with an Account of the Variations in Structure exhibited by *Perionyx excavatus*, E. P. By FRANK E. BEDDARD, M.A., F.R.S.E., Prosector to the Society.

[Received May 18, 1886.]

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2. *Perichæta horsti*, n. sp., p. 300.
3. A new Species of *Eudrilus*, p. 302.
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5. Remarks on the Variation of *Perionyx excavatus*, p. 308.

1. NOTE ON PERICHÆTA INDICA, Horst.

*Perichæta*, sp., Horst, *Nederl. Arch. f. Zool. Bd.* iv. 1879.

*Megascolex indicus*, Horst, *Notes from Leyden Museum*, vol. v. p. 186.

With the exception of *Lumbricus* and other forms affined to it, which ought perhaps to be regarded as subgenera (*Allolobophora*

*Dendrobæna*, &c.), there have been described more species of *Perichæta* than of any other genus. Rather more than thirty have been named, but several of these, as Dr. Horst<sup>1</sup> has pointed out, are merely synonyms, while a large number have evidently been too imperfectly characterized to admit of recognition. In the majority of cases the number of the spermathecæ and the absence or presence of variously formed diverticula have proved useful as specific characters; but species have been distinguished on other grounds which happen to agree in the number and form of the spermathecæ. The presence of genital papillæ is almost universal in the genus *Perichæta*, and these are placed either in the neighbourhood of the spermathecæ or of the reproductive apertures; this character serves to differentiate *P. indica* from *P. affinis*, which otherwise agree pretty closely in structure. I have had the opportunity of examining a number of specimens of both these species as well as of an apparently new species which is closely allied to both. A few notes therefore, which will perhaps serve more clearly to define these species, may be worth adding to what is known about them.

Of *Perichæta indica* I have received about half a dozen specimens from New Caledonia through the kindness of Mr. E. L. Layard, C.M.G. The specimens were of varying size, the largest individuals reaching a length of some 6 inches. Their colour (in alcohol) was a very dark brown, with an indistinct whitish line in the middle of each segment, marking the insertion of the setæ. The latter are remarkable for the fact that one or more on either side of the ventral median line are very much larger than the rest: this fact has already been noted by Horst (Nederl. Arch. &c. *loc. cit.*), and a similar variation in the size of the setæ occurs in Perrier's species *P. luzonica* and *P. biserialis*<sup>2</sup>. The two last-mentioned *Perichætæ* have up to the present been but briefly described; but the description is sufficient to show that they cannot be confounded with *P. indica*. *P. biserialis* has only two pairs of spermathecæ and several pairs of genital papillæ in the segments following the 18th, while there are four pairs of spermathecæ in *P. indica*. In *P. luzonica* the clitellum occupies four segments. Dr. Horst mentions two pairs of genital papillæ placed respectively upon segments 7 and 8; in one of my specimens there were three pairs, the third pair being upon segment 6. Another important variation is in the number of segments which compose the clitellum: in most of the individuals where the clitellum was developed, it was found to occupy segments 14-16 inclusive, as described by Horst for this species and as commonly found in the genus. In one specimen, however, the clitellum was a segment short, being developed only upon the 14th and 15th rings; the clitellum was fully developed upon these segments and sharply defined, as it usually is in this genus. It is of some importance to note this fact, since a species of *Perichæta*, *P. bicincta*, has been characterized mainly on account of the restriction of the clitellum to two segments.

<sup>1</sup> Notes from the Leyden Museum, vol. v. p. 186.

<sup>2</sup> Comptes Rendus, t. lxxxi. (1875) p. 2044.

The individual in question agreed in every other respect with *P. indica*, and the difference in the number of segments constituting the clitellum appears to me rather as an indication that this structure is subject to some variation in the same species than a mark of specific distinctness. With regard to the dorsal pores, they are present in my specimens in all the segments following the clitellum, as stated by Horst; I find, however, that the posterior border of the clitellum is not only marked by a dorsal pore, but the anterior border also, and that there is yet another pore in front of this; this latter appears to be the first.

In all other respects my specimens agreed with Horst's description of *Perichæta indica*, and I believe them to be identical. I need not describe the organs of the body severally, as I was unable to detect any points of difference.

## 2. PERICHÆTA HORSTI, n. sp.

In a collection of Earthworms sent to me from Manila by my friend Mr. H. E. Barwell were a considerable number of specimens of a *Perichæta* which I regard as of a new species. I dedicate it to Dr. Horst, whose work in this department of Zoology is well known. It is a small species, the largest individuals measuring only about 2 inches in length.

The external characters afforded by the genital papillæ serve to distinguish the species; although the value of these characters is well known, it is often impossible to make use of them, as the genital papillæ are not always present to the full number even in worms which are in other respects sexually mature. Out of seven or eight individuals which I have examined and dissected, one or two had very many more genital papillæ than the rest; in the absence of evidence to the contrary, I regard these specimens as being in this respect fully adult. The genital papillæ are placed in the neighbourhood of the male generative pores as in *P. affinis*; but instead of there being only a single pair to each segment, there are three distinct papillæ placed at equal distances from each other and within the circle of setæ. These are present on the two segments which precede the eighteenth and on the four segments which follow it; on the eighteenth segment there is naturally only the median papilla present, the genital orifices themselves occupying the position of the outer papillæ.

In *Perichæta biserialis* and in *P. juliani*, according to Perrier<sup>1</sup>, there is some resemblance in the disposition of the genital papillæ to the condition which is characteristic of the present species; in both of the former there are a pair of genital papillæ corresponding in position to the male reproductive pores and occupying a variable number of segments following the 18th. I have myself had the opportunity of examining a number of specimens of a *Perichæta* from the Philippine Islands, which I refer to the former species from the fact that the ventral setæ are separated by a considerable interval and are of considerably greater size than the remainder, and that

<sup>1</sup> Perrier, Comptes Rendus, *loc. cit.*

there are three or four pairs of genital papillæ, one to each of a corresponding number of segments following the 18th. There was, however, no indication of an additional median papilla on each of the segments as in *P. horsti*, nor does Perrier mention anything of the kind.

The clitellum is not, as is so generally the case, restricted to three segments; but, at least in one specimen, extended from segment 14 to 17 inclusive; on the 17th segment, however, it was only developed on the dorsal region of the body.

The orifice of the oviducts occupies the usual position on the ventral median line of the 14th segment<sup>1</sup>. The spermathecal orifices are between the 7th and 8th and 8th and 9th segments.

The setæ are continuous all round the body and are everywhere of uniform size.

With regard to internal structure, there are one or two features in which this species is peculiar.

In the first place, the spermathecae are separated from each other by very stout mesenteries, which are also found between segments 8-7, 7-6, 6-5; in front of the fifth segment the mesenteries are more or less indistinguishable, forming a mass of muscles which bind the pharynx to the parietes; behind the 9th segment the mesenteries are comparatively thin and delicate. The gizzard is situated in the 8th segment, that which contains the anterior pair of spermathecae; it does not, as is so commonly the case (*e. g.* in *P. affinis*) occupy two segments, the intermediate mesentery having disappeared. The spermathecae consist of an oval or sometimes cylindrical pouch communicating with the exterior by a narrow duct, to which is attached a short diverticulum of much the same shape as the pouch. The diverticulum appears never to lie in a different segment from the spermatheca.

The ovaries and oviducts were very distinct, and appear to occupy the normal position.

The vasa deferentia open on to the exterior in common with the duct of a compact prostate.

The testes are to the number of two pairs and in the usual position. The œsophagus widens into the intestine at about the 20th segment;

<sup>1</sup> The extension of the clitellum over four segments, combined with the regularity and uniform size of the setæ, makes it difficult, in the absence of additional information, to distinguish this species from *P. cœrulea*, E. P.; it is stated, however, that in *P. cœrulea* the female generative orifices are paired. Nevertheless this latter difference is not perhaps of very fundamental value; it must at any rate be discounted by my own observations with regard to *Megascolex* (Ann. & Mag. Nat. Hist., Oct. 1883), where the female pore is sometimes single and sometimes double. *Perichæta taiënsis* of Grube (Reise der Novara, Anneliden, p. 36, pl. iv. fig. 2) is a very doubtful species, agreeing with *P. horsti* in having only two pairs of spermathecae situated in the 8th and 9th segments. It may possibly be identical with it. I may take this opportunity of remarking that several other species described by Grube (MB. Akad. Berlin, 1877, p. 553) are in need of revision. *Lumbricus kerguelarum* appears to me from his description to be undoubtedly referable to the genus *Acanthodrilus*, and perhaps to Lankester's species *A. kerguelensis*; *L. tongaensis* is certainly not a *Lumbricus*, and perhaps belongs to the same genus as the last.

about five or six segments from its commencement, the intestine undergoes a remarkable change in its structure; in three or four segments the walls of the intestine are greatly thickened, but these specially thickened regions are separated by intervals where the intestinal walls have preserved their normal delicacy of structure; these intervals are on either side of the septa. These appearances, which recall the moniliform structure of the œsophagus in *Moniligaster*, can hardly have been brought about by the effects of the alcohol in which the specimens were preserved. There were no cæca present, unless these local thickenings represent the cæca morphologically; in other *Perichætæ* the cæca generally contrast with the intestine by their greater thickness.

On several of the anterior mesenteries were bunches of glandular tubules similar to those found in other *Perichætæ*, and which may represent the nephridia.

The foregoing brief description is, I think, enough to distinguish this species from any that is at all sufficiently known.

### 3. A NEW SPECIES OF EUDRILUS (*Eudrilus boyeri*).

Among some Earthworms kindly sent to me from New Caledonia by Mr. Layard were about a dozen individuals which I refer to Perrier's genus *Eudrilus*<sup>1</sup>. This genus is already known to inhabit South America and the West Indies, but has not been recorded from anywhere else. I am inclined myself to suspect that the New-Caledonian specimens may have been accidentally imported, and may not be indigenous to that island. I name the species after M. Boyer of New Caledonia, who collected the specimens for Mr. Layard. At the same time I am not convinced that the species really is new. It appears to differ from all the three species described by Perrier in the long coiled oviduct, and in the termination of the vasa deferentia at the middle of the prostate gland. With regard to the first mentioned point of difference, I have elsewhere<sup>2</sup> expressed the opinion that M. Perrier has mistaken the relation of the ovary to the spermatheca. The oviduct in my specimens so unmistakably corresponds to what Perrier has described as a diverticulum of the spermatheca, that I cannot but think that they are really identical even if the species are distinct. M. Perrier did not make use of the method of section-cutting, which is so infinitely better than dissection for deciding an anatomical relation like that of the ovary and its duct. Still the difference between my species and his in respect of the vasa deferentia makes me hesitate in asserting that his conclusions are mistaken. With regard to the vasa deferentia, M. Perrier states that in his species they open directly into the bursa copulatrix, and not indirectly by way of the prostate gland as in *Eudrilus boyeri*. With M. Perrier's figure before me it appeared to me that in one instance, at any rate, *Eudrilus boyeri* agreed with *Eudrilus decipiens*; but in two or three other specimens which I dissected the vasa

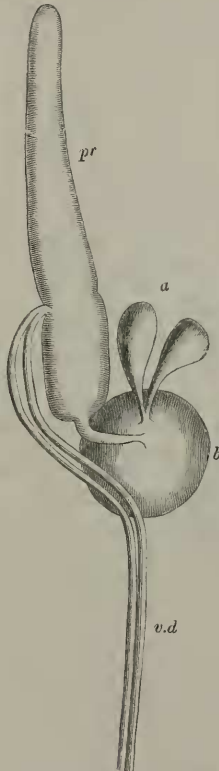
<sup>1</sup> Nouv. Arch. d. Muséum, t. viii. (1872) p. 71.

<sup>2</sup> Proc. Roy. Soc. Edinb. (forthcoming paper); Zool. Anzeig. Bd. ix. (1886) p. 342.



deferentia, although passing over the bursa copulatrix, did not open into it but into the prostate gland, as I have indicated in the drawing (fig. 1). The anterior section of the vasa deferentia (*v.d.*) as far as the bursa copulatrix was very conspicuous, owing to the white colour of the tubes (white from the contained spermatozoa): the distal region of the vasa deferentia was far less conspicuous, and I mistook them at first for a mere ligament uniting the prostate with the surface of the

Fig. 1.

Generative organs of *Eudrilus*.

*a*, glandular appendix; *b*, bursa copulatrix; *v.d.*, vasa deferentia;  
*pr*, prostate.

bursa copulatrix; a more careful examination has shown that the supposed ligament is really a continuation of the vasa deferentia. These tubes, although lying upon the bursa, are in no way adherent to it, and can be readily lifted up with a dissecting-needle; they are then seen to be continuous with the prostate (*pr.*).

In all the species described by Perrier there appears to be but a single vasa deferens on either side of the body, which opens directly into the bursa copulatrix and not, as in my species, into the prostatic glands. The single vas deferens of either side is figured by Perrier (*loc. cit.* pl. ii. fig. 26). In all the specimens of *Eudrilus boyeri* dissected by me there were unmistakably two vasa deferentia on each side of the body, which after came to be separated by a considerable interval, owing perhaps to the contraction of the body-walls, though more usually lying side by side and in close juxtaposition. The only other genus in which there are two vasa deferentia on each side of the body is *Acanthodrilus*, and this is in correspondence with the two generative orifices of each side; where there is only a single pair of male generative pores, the vasa deferentia become fused directly behind the posterior funnel and pass down the body as a single tube. In *Microchæta*, however, Benham<sup>1</sup> has described the two vasa deferentia of each side continuing separate for several segments, though they ultimately become fused some way in front of the male generative pore.

The condition of the vasa deferentia in *Eudrilus boyeri* forms another intermediate term in the series which connects *Acanthodrilus* with *Lumbricus*; in *Acanthodrilus* the two vasa deferentia are separate throughout their whole extent and their external apertures are each furnished with a prostate gland<sup>2</sup>. In *Eudrilus boyeri* there is only a single generative opening, but the vasa deferentia remain distinct. In *Microchæta*, where there is also a single male generative pore, the vasa deferentia of each side are partially fused. Finally, in *Lumbricus* and other genera the vasa deferentia unite immediately behind the posterior internal funnel.

The *nephridia* of this species are well developed, and open in every case in front of the dorsal setæ. The organs themselves are remarkable for the very large muscular duct.

The *alimentary tract* presents certain features of interest. The œsophagus is furnished with three pairs of thick-walled whitish-coloured glands disposed in pairs in consecutive segments, viz. 11, 12, and 13; the posterior pair was smaller than the two anterior pairs. These glands appeared to have a lamellar structure, and the interior was filled with irregularly-shaped calcareous masses: there seems to me to be no doubt that these structures correspond to the calcigerous glands of *Lumbricus*. Along the intestine are another series of glands, about 40-50 pairs, commencing in the 90th segment. There is a single pair of these glands to each segment, which become larger towards the middle of the series, and

<sup>1</sup> Quart. Journ. Micr. Sci. vol. xxvi.

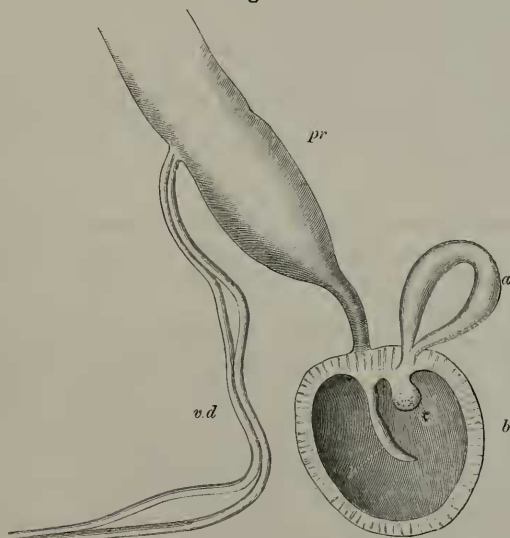
<sup>2</sup> In a species of *Perichæta* recently described by myself (*Ann. & Mag. Nat. Hist.* 1886, xvii. p. 89) there are two prostates on either side, whose apertures are, however, situated in the same segment, and not in different segments as in *Acanthodrilus*. The condition of the specimen was such that I could not detect the connection of these with the vasa deferentia. It seems very possible that each prostate may correspond to a single vas deferens, in which case the male generative organs of this worm will be in certain respects intermediate between those of *Acanthodrilus* and *Eudrilus boyeri*.

diminish in size towards either extreme. These glands are situated on the dorsal wall of the intestine, close to and on either side of the dorsal vessel; each is supplied with a rich plexus of blood-vessels derived from the most anterior of the two vessels which arise from the dorsal trunk in each segment.

These glands are probably of the same nature as those described by myself in a similar position in *Megascolex*<sup>1</sup> and *Typhaeus*<sup>2</sup>, and by Dr. Horst<sup>3</sup> in *Acanthodrilus*.

The female reproductive organs I have already described; they are quite unique in that the ovary is directly continuous with its efferent duct, which opens on to the exterior in common with the

Fig. 2.



Generative organs of *Eudrilus*, with bursa copulatrix laid open.

*p*, penial process; *c*, pad-like process connected with glandular appendix.  
Other lettering as in fig. 1.

spermatheca. The male reproductive organs are also remarkable; they have been described by M. Perrier in all the three species of the genus; my own dissections do not altogether bear out his statements, but of course the differences may be specific; they are hardly individual, inasmuch as three or four specimens agreed perfectly.

In most cases there were three pairs of vesiculæ seminales, situated in segments 10, 11, 12; with these are connected a pair of vasa

<sup>1</sup> Trans. Roy. Soc. Edinb. vol. xxx. pt. ii. p. 493.

<sup>2</sup> Ann. & Mag. Nat. Hist. 1883, xii. p. 222.

<sup>3</sup> Notes from Leyden Museum, vol. vi. p. 103.

deferentia on each side, which were invariably extremely conspicuous; the two vasa deferentia of each side remained perfectly distinct, and could readily be traced as far as the prostatic gland, into which they open. The latter structure is a tubular organ of a nacreous appearance, lying behind the generative orifice, and occupying some five or six segments; it communicates with a large rounded pouch-like structure (figs. 1, 2, *b*), which overlies the generative pores on either side, by a narrow duct. The prostatic gland is constricted at about the middle of its extent, and it is at this point that the vasa deferentia open into it. M. Perrier has accurately figured the appearance presented by the 'bursa copulatrix' when its upper wall has been removed (*loc. cit.* pl. ii. figs. 27, 28). I find that the duct of the prostatic gland is continuous with the curved penis (woodcut fig. 2), while the rounded pad (*c*) which lies behind the penis receives the duct of a peculiar glandular body (*a*), which is either horseshoe-shaped as in fig. 2 or Y-shaped as in fig. 1. This glandular appendix has been referred to by Perrier, who did not, however, succeed in making out its relations with the bursa copulatrix; neither has M. Perrier figured or described the termination of the prostatic duct in the penis.

#### 4. ADDITIONAL NOTE ON MICROCHÆTA RAPPII, F. E. B.

Since my paper on the structure of this Worm was communicated to the Society, Mr. Benham has published a careful and detailed account of its anatomy.

The description of the female generative apparatus which Mr. Benham gives<sup>1</sup> agrees in the main with my own description, which I have left unaltered in the paper. A structure which I identified with the oviduct—a pair of ciliated funnels on the posterior wall of segment 12—has appeared to Mr. Benham not to be really an oviduct but to be related to a glandular structure on the anterior septum of segment 12, possibly serving as the excretory duct of its products. On the other hand, the structure described by myself as an ovary, lying in the segment behind that which contains the presumed oviduct (*Trans. Zool. Soc.* vol. xii. pt. 3, pl. xv. fig. 4, *o*), is also identified as such by Mr. Benham.

I am now inclined to think that both Mr. Benham and myself were wrong in that identification, and that the supposed ovary really corresponds to what has been termed by Bergh<sup>2</sup> the *receptaculum ovarum*. In the first place, Mr. Benham remarks that the ova which completely filled this supposed ovary exhibited no gradation in size among themselves such as is to be seen in the ova of *Lumbricus*; in the second place, I have observed this structure in another example of the worm, recently received at the Gardens from the Rev. G. H. R. Fisk, where it was entirely devoid of ova. I cut a careful series of sections through the 'ovary' and oviduct, and could

<sup>1</sup> *Quart. Journ. Micr. Sci.* 1886, p. 279, pl. xvi. figs. 7, 8, 14.

<sup>2</sup> *Zool. Anzeiger*, no. 220, p. 232.

find no traces whatever of ova in the former body, and its walls were comparatively thick and composed of muscular or perhaps connective-tissue fibres. These two series of facts are very decidedly opposed to the view that this body is really the ovary, and I have no doubt whatever that it corresponds to the receptaculum ovarum. In *Lumbricus* the receptaculum ovarum was correctly described by Hering, as Bergh has pointed out. More recently the structure has been figured by Dr. Horst<sup>1</sup>, who also quotes Hering's observations. I have myself observed an evidently similar structure attached to the oviduct of *Acanthodrilus dissimilis*. Dr. Bergh describes the origin of these bodies as being similar to that of the receptacula seminis; they arise on the anterior wall of segment 13, and are at first independent of the oviducal funnels but subsequently unite with them. In *Microchæta* these receptacula ovarum appear therefore more completely to retain their primitive position. It was obvious, however, from my sections that there was a communication through the mesentery between the receptacula and the oviduct. The identification of the supposed ovaries with the receptacula ovarum confirms so far the accuracy of my own determination of the oviducal funnel. I am bound to say, however, that a most searching examination of my sections failed to bring to light any traces of the oviducal canal. I see that Mr. Benham has also failed to detect any connection between the funnel and the exterior. Assuming, at least for the present, that the supposed ovary is nothing more than a receptaculum ovarum, the true ovary remains to be identified. This I believe to be a glandular-looking body in segment 12, noted by Mr. Benham but overlooked by myself at the time when my paper was written. Mr. Benham describes and figures (*loc. cit.* pl. xvi. fig. 8) this gland as consisting of a "mass of rounded cells arranged in a band which is bent upon itself several times, the folds being close to one another." It is attached to the anterior septum of somite 12. In the specimen of this worm more recently dissected by myself, I have found a structure which must correspond to that described by Mr. Benham, though it occupies a slightly different position and is somewhat different in structure. This gland in my specimen was elongated and composed of a mass of rounded indifferently cells; the anterior end of the gland was wider than the posterior extremity, which tapered gradually, and was attached to the anterior mesentery of segment 12; the main part of the gland lay along the ventral body-wall close to the nerve-cord.

The reasons which lead me to suppose that this cellular mass represents an ovary in a state of functional inactivity are—first, that it occupies the right position; secondly, that it corresponds exactly in structure to certain glandular bodies in *Acanthodrilus dissimilis*<sup>2</sup>, in which I have observed the occasional development of ova.

<sup>1</sup> Tijdschr. d. Nederl. Dierk. Vereen. Deel iii. afl. i. p. 28.

<sup>2</sup> P. Z. S. 1885, p. 823, pl. lii. fig. 9.

5. REMARKS ON THE VARIATION OF *PERIONYX EXCAVATUS*,  
E. Perrier.

Hardly anything is at present known with respect to the variations in structure which may occur in a given species of Earthworm; and in order clearly to define the limits of different species it is evidently a matter of some importance to ascertain how far variation may take place. The description of by far the majority of exotic forms of Lumbricidæ has depended upon the dissection of a very few examples, so that many of these descriptions must be qualified by admitting the possibility that they relate only to what may be termed for convenience' sake the normal conditions of structure. Such a criticism, however, can only be applied to those instances in which a species or genus has been created for the reception of a single individual, which may show well-marked divergencies in structure from its immediate allies; if a number of individuals agree to differ from a second series of individuals in certain well-marked characters, it would be obviously necessary to separate the two groups either generically or specifically as the case demands.

The Lumbricidæ are a group which exhibit a most remarkable variability in internal structure, more especially of the generative system; in accordance with this variability they have been divided into a considerable number of species and genera. It might well be expected that this group, which is apparently universally distributed and is at present no doubt as abundant, or even more abundant<sup>1</sup>, in individuals as well as in species as it ever was, is still in course of differentiation into new forms; any accidental variation may be the first term of a series which will ultimately lead to the formation of a new species.

I have had the opportunity of examining, through the kindness of my friend Mr. Herbert Barwell, rather more than 400 individuals of a Philippine Earthworm belonging to the genus *Perionyx*; this worm exhibits a number of variations which appear to me to be really variations, and not marks of specific distinctness. The reasons for this belief will be stated after the facts have been detailed.

The Earthworm in question appears to be identical in every respect with *Perionyx excavatus*: it differs in no point from M. Perrier's<sup>2</sup> description of that species. I need hardly therefore describe in detail its specific characters, as it would be merely repeating what Perrier has already said; it will be necessary, however, briefly to indicate the main features of its organization in order to render clear what follows.

The setæ are disposed in a continuous row round the middle of each segment; they are not disposed upon a ridge as in *Perichæta*,

<sup>1</sup> There seems to be a certain relation between the abundance of Earthworms and the cultivation of the soil; this fact is noted in a short article on Earthworms in the 'Field' of March 27, 1886. My friend Mr. James Cavan informs me that in California fishermen know well that if worms are required for bait they must be sought for in cultivated land.

<sup>2</sup> Nouv. Arch. d. Mus. t. viii. (1872) p. 126.

and this character serves to distinguish the genus from *Perichæta* in addition to those mentioned by Perrier.

Between the 7th and 8th and the 8th and 9th segments are the orifices of the spermathecæ, which lie in the 8th and 9th segments respectively; the orifices are near to the ventral median line. On the 12th segment anterior to the circle of setæ is the single median aperture of the oviducts.

On the 18th segment are the paired apertures of the vasa deferentia, which lie close together upon two slightly raised papillæ<sup>1</sup> situated in an oval depressed area (see fig. 5, p. 310).

Among rather more than 400 individuals I observed the following varieties:—

(1) The spermathecæ were situated in segments 7 and 8; the female generative pore was upon segment 11; the male generative pores upon segment 16. The clitellum occupied segments 12–15 inclusive (fig. 3).

(2) The female generative pores were two, one upon each of the two segments 13 and 14; they were unpaired and median; the male generative pores occupied the normal position upon segment 18.

(3) The spermathecæ were normal, viz. two pairs in 8 and 9. The female generative pores were paired as in the last variety, and occupied the same segments (viz. 13 and 14); the male pores were upon segment 17. The clitellum extended from segments 13–17.

(4) The female generative pores occupy segments 15 and 16; the male pores are upon segment 20.

(5) Of this variety there were two examples. In one the spermathecæ are normal, in segments 8 and 9. In both the female pores are paired, but situated close to each other on the 14th segment; the male pores occupy the normal position upon the 18th segment. In one specimen the clitellum extended from 13–17.

(6) The spermathecæ are present to the number of two pairs, but are situated in segments 6 and 7; the single female generative pore is upon segment 10. There are apparently three pairs of male generative pores upon segments 14, 15, and 16; only the two first pairs were furnished with prostate glands; the hinder pair therefore are probably to be compared to genital papillæ (fig. 4).

(7) The female pores are upon segments 15 and 16; the male pores occupy the normal position upon segment 18.

(8) The female pores are upon segments 14 and 15; the male pores upon segment 18.

(9) In this variety there are three pairs of spermathecæ, occupying

<sup>1</sup> In a description of a new species of *Perionyx* (*P. macintoshii*, Ann. & Mag. Nat. Hist. 1883, xii, p. 217) I have described the openings of the vasa deferentia as differing from those of *P. excavatus* in being placed in an area which is not depressed below the level of the surrounding integument. I find by an examination of a large series of *P. excavatus* that this supposed specific distinction is probably due to the immaturity of the single specimen of *P. macintoshii*; in immature examples of *P. excavatus* the male genital apertures are precisely as I have described them in *P. macintoshii*. The latter species, however, seems to me to be distinct on account of the structure of the prostate glands and the thickened mesenteries of segments 6–9.

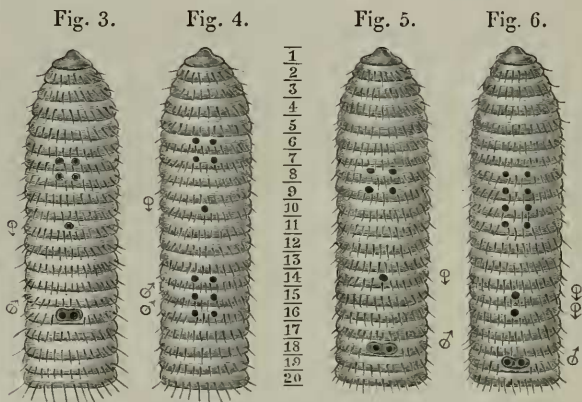
segments 7, 8, and 9. The female pore is single and upon segment 14; the male pores are upon segment 17.

(10) There are four pairs of spermathecae occupying segments 8, 9, 10, and 11. The oviducal pores are two, upon segments 15 and 16. The male generative pores are upon segment 19. The clitellum extends from segments 15-18 inclusive (fig. 6).

(11) There are three pairs of spermathecae in segments 6, 7, and 8. The female generative pores are upon segments 13 and 14; the male generative pores are upon segment 16.

(12) Of this variety I noted two specimens. The female and the male pores were perfectly normal, but the 18th and 19th segments were only separated from each other on the right side of the body; on the left side they were fused.

(13) There were also two specimens of this variety. The female pores were upon segments 14 and 15; the male pores occupied the normal position upon segment 18.



Figs. 3, 4, 6. Varieties of *Perionyx creavatus*. Fig. 5. Normal individual.

(14) There were two pairs of spermathecae, occupying the ordinary position in segments 8 and 9. The female generative pores were upon segments 15 and 17; the male pores upon segment 21. Segments 11, 12, and 18, 19 were only divided from each other on the left side of the body. Viewed from the right side, the female pores were upon segments 14 and 15, the male pores upon segment 18.

(15) The female generative pores were upon segments 15 and 16; the male pores upon segment 18.

These different varieties may be tabulated as follows:—



	Spermathecae.	♀ pores.	♂ pores.	Clitellum.
Normal .....	8, 9	14	18	14-17
Var. 1 .....	7, 8	11	16	12-15
" 2 .....	.....	13, 14	18	
" 3 .....	8, 9	13, 14	17	13-17
" 4 .....	.....	15, 16	20	
" 5 (2) ...	8, 9	14, 14	18	13-17
" 6 .....	6, 7	10	14, 15	
" 7 .....	7, 8, 9, 10	15, 16	18	
" 8 .....	.....	14, 15	18	
" 9 .....	7, 8, 9	14	17	
" 10 .....	8, 9, 10, 11	15, 16	19	15-18
" 11 .....	6, 7, 8	13, 14	16	
" 12 (2) ...	8, 9 (right); 9, 10 (left)	14	18	
" 13 (2) ..	8, 9 (right); 9, 10 (left)	14, 15	18	
" 14 .....	8, 9	15, 17	21	
" 15 .....	.....	15, 16	18	

In considering a series of variations like the present, it is necessary in the first place to discriminate between what are really variations and what are specific characters. I have stated at the commencement of this paper my belief that the anatomical differences between the individuals described here are variations, and not marks of specific difference. This opinion is based upon the following facts:—*First*, the exact correspondence in colour, size, and all anatomical characters, except those liable to variation, between the different individuals. It may, perhaps, be objected that it is begging the question to assume that it is precisely those characters which are liable to variation in this "species" that are unimportant as marks of specific difference; especially when it is remembered that these differences mainly concern the genital system, which is well known to exhibit constant and regular variation, serving as a basis of classification. It is indeed perfectly true that this is the case; but then the variations in the genital system are constantly accompanied by equally regular, though perhaps inconspicuous, variations in other characters; so that a naturalist acquainted with this group could probably easily determine any species known to him by external characters only. It is not meant to imply by this statement that external characters are sufficient to decide the systematic position of an Earthworm, but merely to emphasize the fact that when, after dissection, the relations of internal structure to external form are known, the latter characters will serve as a guide to recognize the species.

*Secondly*, the fact that the supposed variations are never represented by many specimens. Out of some 430 individuals I have recorded 15 variations, 12 of which are exhibited in as many specimens, while 3 are represented by two specimens apiece. The importance of this argument is in exact proportion to the number of specimens examined; in the present instance it appears to me to be fairly sound.

*Thirdly*, Earthworms are known to vary somewhat in structure,

though there has never, to my knowledge, been described so great a number of variations as I have been able to record in the present communication. Dr. Horst<sup>1</sup> has recorded a variation in the form of the spermathecae of *Perichæta indica* and in the caeca of *Perichæta musica*, and Perrier<sup>2</sup> in the spermathecae of *Perichæta affinis*.

Fourthly, and lastly, the probability, suggested above, of the occurrence of variations must not be left out of sight.

Assuming it to be proved that an actual variation does occur in the present species, it will be necessary in the next place to eliminate those variations that are mere monstrosities, and that can hardly be considered to have any importance. Such are the occasional doubling of segments on one side of the body, as the variations Nos. 4, 12, and 14; these are comparable to such monstrosities among Vertebrata as two-headed lambs, calves with five limbs, and so forth, which are not in any sense reversion to an ancestral type, but are owing to some accidental cause, such as defective or excessive nutrition. On the other hand, the remaining variations are to my mind of some importance. These will now be considered in some detail.

It must be noted first of all that the variations occur in the generative system, and it is precisely the modifications of this system which have enabled systematists to classify the group.

These variations affect all the parts of the generative system—the clitellum, the ovaries and their ducts, the spermathecae, and the male organs.

I will commence with the clitellum. This organ and the relations which it bears to the male generative apertures has enabled M. Perrier to classify the whole group, after a fashion which is in the main satisfactory, though open to objections in certain cases. I have elsewhere urged that, in so far as it separates the Anticlitellians, *i. e.* *Lumbricus* and its allies, from the remaining genera of Earthworms, M. Perrier's system is by no means artificial, but bears out other anatomical differences. To distinguish the Intra- and Postclitellians from each other is not so easy a task: in the first place, we have genera like *Megascolex*, whose affinities are clearly with *Perichæta*, and which yet possess Intraclitellian generative apertures; in the second place, we find that within the limits of a single genus, *i. e.* *Acanthodrilus*, the male generative orifices vary in position, and may be either intra- or post-clitellian.

If the relations of the clitellum to the male generative apertures be used for classificatory purposes, it appears to me necessary somewhat to alter Perrier's definition, and to divide Earthworms into two groups, according as to whether the clitellum is placed far forward, and commences *in front* of the male generative orifices, or whether it is placed further back and commences *behind* the male generative orifices.

That there is really a connection between the clitellum and the

<sup>1</sup> Notes from the Leyden Museum, vol. v. p. 182.

<sup>2</sup> Nouvelles Arch. &c. *loc. cit.* p. 106. These facts are of course liable to the same criticism as my own.

generative orifices is certainly shown by the series of variations in *Perionyx* described in the present paper. When the male generative pores, as in var. no. 1, are placed very far forward, the clitellum also moves forward; on the other hand, when the male generative pores are situated further back, *e. g.* in segment 19, the clitellum likewise changes its position and occupies segments 15–18.

In both these instances it will be noted that the relations of the male pore to the clitellum remain the same, although both structures have shifted their position; in both cases, as in the normal condition, the male generative pore occupies the first segment *after* the clitellum. This fact would at first sight appear to be a strong argument in favour of Perrier's scheme of classification; but in the first place the clitellum extends in var. No. 1 on to the left half of segment 16, and in the second place one variety (No. 3) was distinctly 'intraclitellian,' through the shifting forward of the generative pores on to the 17th segment.

*Ovaries and Oviducts.*—I have been able to prove by dissection that the presence of two pairs of oviducts in consecutive segments is a reality; the two oviducts of each side were quite obvious and were each furnished with their own ovary. Moreover in var. No. 11 there was an additional (third) ovary in segment 11, on the right-hand side. In var. No. 10 I also noted three pairs of ovaries.

The occasional occurrence of more than a single pair of ovaries in this Earthworm lends additional support to my identification in *Acanthodrilus* of certain glandular structures with rudimentary ovaries, and also to Prof. Lankester's description in *Chaetogaster* of two pairs of ovaries, which has been recently doubted by Vejdovsky<sup>1</sup>. In the present instance there can be no doubt of the presence occasionally of two or three pairs of ovaries, since they were extremely conspicuous on account of their large size, and contained abundant mature ova.

In two varieties (No. 5) there were only a single pair of ovaries present, but with separate openings on to the exterior. I have already in the present paper (p. 301, note) referred to the fact that this variation also occurs in *Megascolex*.

*Spermathecae.*—The number and position of the spermathecae have been so constantly made use of as a systematic character, that it is well to emphasize their variations in the present species. They vary from two to four pairs, and may be placed in any of segments 6–11. In most cases they get to be placed further forward when the male generative pores shift their positions forward, but this relation is by no means constant. The occasional symmetry of these organs (*e. g.* in var. No. 12 and 13) cannot be a matter of any importance; it was only observed in two of the four specimens.

*Male Generative Pores.*—The position of these pores varies from segment 14–21, but they were invariably behind the female generative pores; there was particular relation between the positions of the male and female pores, except that the latter were *always* in front of the former.

<sup>1</sup> System u. Morph. d. Oligochäten, p. 145.

The variation in position of these apertures is of importance, because certain genera (e. g. *Urochæta*, *Eudrilus*, *Rhinodrilus*) are characterized by the different position of the male pores, which are almost always (*Perichæta*, *Perionyx*, *Megascolex*, *Anteus*, and *Microchæta*) upon the 18th segment. In one instance (No. 6) there were two pairs of male generative orifices on following segments (14, 15), and on segment 16 a pair of orifices which appear to be papillæ, since they are not furnished with the prostates of the anterior orifices. The presence of two pairs of male orifices, each with their own prostate, is of importance, since a genus (*Acanthodrilus*) is mainly distinguished on account of this very peculiarity. The normal individuals of *Perionyx excavatus* have no genital papillæ, which are so characteristic of many species of *Perichæta*; in the variety just mentioned, as well as in No. 8, there were a pair of similar papillæ.

*Nephridia*.—In one instance I observed an alternation in the position of the nephridial pores, confined, however, to a single pore, which was placed considerably nearer to the dorsal median line than the pores on the preceding and ensuing segments.

In conclusion I would again point out that the variations recorded in this paper mainly affect the generative system, which is known to exhibit such characteristic differences in various genera and species. I have not noticed any prominent variations in other organs.

### 3. Remarks on the various Species of Wild Goats. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received May 17, 1886.]

(Plates XXXI. & XXXII.)

The male Sinaitic IbeX which we received as a present from Mrs. Laing in December 1884<sup>1</sup> has now become a fine animal. As the first of the species that has reached the Society's Gardens, I have thought that a portrait of it would not be inappropriate to the Society's 'Proceedings;' and I have accordingly had the accompanying sketch (Plate XXXII.) prepared by Mr. Smit, which will give a good idea of the original.

The animal stands about 31 inches high, and is generally of a dark rusty brown colour, with black dorsal stripe and limbs, the latter being white on the inner sides and on the knees.

I take this opportunity of offering a few remarks on the known species of Wild Goats and their distribution. I will mention them in geographical order, commencing with the westernmost species, and proceeding eastwards, alluding especially to those of which we have received living specimens.

<sup>1</sup> See P. Z. S. 1885, p. 2.



P. Smit. lit.

CAPRA AEGAGRUS, ♂

ca. 1886





P. Smit del.

CAPRA SINAITICA, ♂.

Hanhart imp.

